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(71)Applicant : MITSUBISHI RAYON CO LTD
RYOKO:KK
(72)Inventor : USUBA YASUYUKI

(54) PLASTIC MIRROR

(57)Abstract:
PROBLEM TO BE SOLVED: To produce a plastic mirror excellent in reflecting characteristics as a mirror and in the adhesion of a thin silver film at a low cost.
SOLUTION: The plastic mirror consists of a transparent plastic sheet, transparent surface hardening films formed on both faces of the sheet, a thin silver film formed on one of the surface hardening films by an electroless silver mirror reaction after surface activation by plasma treatment, corona treatment, alkali treatment or chromic acid treatment and a thin copper film formed as a protective coat on the thin silver film by electroless plating.

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CLAIMS

[Claim(s)]
[Claim 1] The mirror made of synthetic resin characterized by consisting of a silver thin film formed using non-electrolyzed silver mirror reaction on a transparent synthetic-resin plate, the transparent hard facing film formed in the both sides, and said hard facing film of one of the two which activated the front face by plasma treatment, corona treatment, alkali treatment, or chromate treatment, and a copper thin film formed as a protective coat by the electroless deposition method on this silver thin film.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the mirror made of synthetic resin excellent in the reflection property as a mirror, and the adhesion of a silver mirror plane (silver thin film) which can be manufactured cheaply.
[0002]
[Description of the Prior Art] Although the glass mirror which silver was deposited in the glass substrate and generally formed the silver thin film in one side of a transparent glass substrate as a mirror with the high rate of a light reflex by the **** reaction which is not electrolyzed [which returns the silver plating liquid containing an ammonia nitric-acid Ginsui solution by grape sugar or the aldehyde] is known, such a glass mirror always has the danger of breakage, and needs careful caution for handling. Moreover, it is dramatically difficult for weight to increase remarkably in a large-sized article, for consideration special to the haulage installation to be needed, and for workability to cut in the configuration of arbitration bad further.
[0003] Although the mirror which used the synthetic-resin plate as the substrate is also known as a mirror which canceled the fault of such a glass mirror, generally this mirror made of synthetic resin is manufactured by the vacuum deposition method, and since the high vacuum condition is indispensable, it has the difficulty that a manufacturing cost becomes high.
[0004] Although there is the approach of depositing silver on a synthetic-resin plate front face by silver mirror reaction, and forming a silver thin film as an approach of reducing the manufacturing cost of this mirror made of synthetic resin, by this approach, the adhesion of a silver thin film is dramatically bad, and there is a practical problem.
[0005]
[Problem(s) to be Solved by the Invention] This invention cancels the above-mentioned conventional trouble, and offers a technical problem the mirror made of synthetic resin excellent in the reflection property as a mirror, and the adhesion of a silver thin film which can be manufactured cheaply.
[0006]
[Means for Solving the Problem] A synthetic-resin plate with the above-mentioned transparent technical problem, and the transparent hard facing film formed in the both sides, The silver thin film formed using non-electrolyzed silver mirror reaction on said hard facing film of one of the two which activated the front face by plasma treatment, corona treatment, alkali treatment, or chromate treatment, It is solved in the mirror made of synthetic resin characterized by consisting of copper thin films formed as a protective coat by the electroless deposition method on this silver thin film.
[0007]
[Embodiment of the Invention] In this invention, although the transparent synthetic-resin plate which consists of methacrylic resin, polycarbonate resin, vinyl chloride resin, styrene resin, or cellulose type resin is suitably used as a synthetic-resin plate used as a substrate, even if palely colored extent which does not spoil transparency, it does not interfere. Moreover, as the thickness, about 0.5-5mm is suitable.

[0008] As hard facing [redacted] formed in both sides of a synthetic-[redacted] plate By the hardening film with a thickness of about 2-10 micrometers with transparent acrylic, silicon system, methylol-ized melamine system, etc. Although the thing of the bridge formation hardening mold formed by heating condensation etc. is suitably used after applying coating which consists of resin constituents, such as a thing of an ultraviolet curing mold which ultraviolet rays were irradiated [thing] and stiffened them after applying the covering material constituent which can be hardened by ultraviolet rays, such as acrylic, a silicon system, and a melamine system The acrylic hard facing film of points, such as adhesion with a base material, membranous engine performance, and productivity, to an ultraviolet curing mold is desirable.
[0009] Moreover, as for surface activity-ized processing of the hard facing film, the usual plasma treatment, corona treatment, alkali treatment, or chromate treatment is applied.
[0010] Plasma treatment impresses high tension to the gas ambient atmosphere under low voltage, exposes a synthetic-resin plate to the glow discharge to maintain, and processes the hard facing film of a synthetic-resin plate by activity particles, such as an electron generated during glow discharge, ion, an excited atom, a radical, and ultraviolet rays. As gas introduced in a vacuum system, inorganic gas, such as oxygen, nitrogen, air, and an argon, organic compound steams, or such mixture can be used. As for the gas pressure in a system, it is preferably desirable to process for 1 - 5 minutes by 0.01 - 0.5Torr (1.33-66.5Pa) 0.001 to 0.1 Torr (0.133-13.3Pa).
[0011] When the field of strong electric field carries out localization of the high tension to an electric wire like [at the time of being missing], the local discharge (corona discharge) limited to this field produces corona discharge treatment. A synthetic-resin plate is made to intervene under this discharge, and surface activity-ized processing of the hard facing film is performed. Although corona discharge usually uses an alternating current, a forward or negative corona may be used if needed. Using the corona discharge processor in which consecutive processing which has a RF transmitter and an electrode is generally possible, between a corona discharge electrode and counter-electrodes is passed, and a synthetic-resin plate is processed continuously.
[0012] As for alkali treatment, it is desirable to perform surface activity-ized processing of the about [a 5-10 minute room] hard facing film at 25 degrees C using alkali solutions (concentration 2 - 10w%), such as a sodium hydroxide and a potassium hydroxide.
[0013] On the hard facing film to which surface activity-ized processing was performed, a silver thin film with a thickness of about 10-150nm is formed using non-electrolyzed silver mirror reaction, and a copper thin film is further formed as a protective coat with a thickness of about 10-150nm by the electroless deposition method on a silver thin film. Moreover, the protection paint film which consists of various coatings may be prepared on a copper thin film.

[0014]
[Example] An example explains this invention still more concretely below.
[0015] (Example 1) The covering material constituent of an acrylic ultraviolet curing mold was applied to both sides of a transparent acrylic resin plate, ultraviolet rays are irradiated, and were stiffened, and the hard facing film of 5 micrometers of thickness was formed. Subsequently, ammonia nature silver-nitrate water-solution AgNO360 g/l with ammonia superfluous after leaving an acrylic resin plate for 10 minutes and rinsing and surface-activity-izing it in concentration 10w% and an alkali water solution with a temperature of 25 degrees C (A liquid), Sodium-hydroxide water-solution NaOH40 g/l (B liquid) and grape-sugar water-solution C6H12O630 g/l (C fluid) are prepared. A liquid, B liquid, and the silver plating liquid that mixed C fluid at a rate of 4:1:1 were carried at the room temperature of 25 degrees C on the hard facing film which the acrylic resin plate surface-activity-ized, and was left at it. Since the hydrophilic group was generated by the surface-activity-ized hard facing film, the uniform silver thin film was formed of the silver reaction on breadth and the hard facing film at homogeneity, without crawling silver plating liquid. In order to protect this silver thin film, the copper thin film was formed with the copper(II) sulfate water-solution reducing-agent solution (zinc powder suspension), the lining coating was applied further, the protection paint film was

prepared, and the mirror made of acrylic resin was obtained. The obtained mirror made of acrylic resin had the dramatically strong adhesion of a silver thin film, and it was [the reflection property] excellent.

[0016] (Example 2) Direct-current mold vacuum discharge equipment was used for surface activity-ized processing of the hard facing film, and the mirror made of acrylic resin was obtained like the example 1 except impressing and carrying out plasma treatment of 7000V for 5 minutes by gas pressure 0.01Torr (1.33Pa) in an argon gas ambient atmosphere. Like what was obtained in the example 1, the obtained mirror made of acrylic resin had the dramatically strong adhesion of a silver thin film, and it was [the reflection property] excellent.

[0017]

[Effect of the Invention] According to this invention, the adhesion of a silver thin film is dramatically strong, and the mirror made of synthetic resin which was excellent also in the reflection property can be cheaply manufactured by the easy approach.

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(71)出願人　000006035
三菱レイヨン株式会社
東京都港区港南一丁目６番41号
(71)出願人　390025313
株式会社菱晃
東京都中央区入船１丁目３番９号
(74)上記１名の代理人　100091948
弁理士　野口　武男
(72)発明者　蒋羽　保之
東京都中央区入船一丁目３番９号　アクリミラー株式会社内

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(54)【発明の名称】　合成樹脂製鏡

(57)【要約】
【課題】　鏡としての反射特性と銀薄膜の密着性に優れた安価に製造可能な合成樹脂製鏡を提供する。
【解決手段】　透明な合成樹脂板と、その両面に形成された透明な表面硬化膜と、プラズマ処理、コロナ処理、アルカリ処理、又はクロム酸処理により表面を活性化した片方の前記表面硬化膜上に無電解の銀鏡反応を利用して形成された銀薄膜と、該銀薄膜上に無電解メッキ法により保護膜として形成された銅薄膜とから構成されている合成樹脂製鏡。

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【特許請求の範囲】

【請求項１】　透明な合成樹脂板と、その両面に形成された透明な表面硬化膜と、プラズマ処理、コロナ処理、アルカリ処理、又はクロム酸処理により表面を活性化した片方の前記表面硬化膜上に無電解の銀鏡反応を利用して形成された銀薄膜と、該銀薄膜上に無電解メッキ法により保護膜として形成された銅薄膜とから構成されていることを特徴とする合成樹脂製鏡。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、鏡としての反射特性と銀鏡面（銀薄膜）の密着性に優れた安価に製造可能な合成樹脂製鏡に関するものである。

【０００２】

【従来の技術】一般に、光反射率の高い鏡としては、透明なガラス基板の片面に、アンモニア硝酸銀水溶液を含む銀メッキ液をブドウ糖やアルデヒドで還元する無電解の銀境反応により、ガラス基板に銀を析出させて銀薄膜を形成したガラス製の鏡が知られているが、このようなガラス製の鏡は常に破損の危険性があり、取扱に細心の注意が必要である。また、大型品では重量が著しく増大し、その運搬設置に特別の配慮が必要となり、更に加工性が悪く任意の形状に切断することが非常に困難である。

【０００３】このようなガラス製鏡の欠点を解消した鏡として、合成樹脂板を基板とした鏡も知られているが、この合成樹脂製鏡は一般に真空蒸着法により製造され、高真空状態が必要不可欠であるため製造コストが高くなるという難点がある。

【０００４】この合成樹脂製鏡の製造コストを低減する方法として、銀鏡反応により合成樹脂板表面に銀を析出させ、銀薄膜を形成する方法があるが、この方法では銀薄膜の密着性が非常に悪く、実用上の問題がある。

【０００５】

【発明が解決しようとする課題】本発明は、上記従来の問題点を解消し、鏡としての反射特性と銀薄膜の密着性に優れた安価に製造可能な合成樹脂製鏡の提供を課題とする。

【０００６】

【課題を解決するための手段】上記課題は、透明な合成樹脂板と、その両面に形成された透明な表面硬化膜と、プラズマ処理、コロナ処理、アルカリ処理、又はクロム酸処理により表面を活性化した片方の前記表面硬化膜上に無電解の銀鏡反応を利用して形成された銀薄膜と、該銀薄膜上に無電解メッキ法により保護膜として形成された銅薄膜とから構成されていることを特徴とする合成樹脂製鏡によって解決される。

【０００７】

【発明の実施の形態】本発明において、基板となる合成樹脂板としては、メタクリル樹脂、ポリカーボネート樹脂、塩化ビニル樹脂、スチレン樹脂、又はセルロース系樹脂等からなる透明な合成樹脂板が好適に用いられるが、透明性を損なわない程度に淡く着色されていても差し支えない。またその厚さとしては０．５～５ｍｍ程度が適当である。

【０００８】合成樹脂板の両面に形成される表面硬化膜としては、アクリル系、シリコン系、メチロール化メラミン系等の透明な２～１０μｍ程度の厚さの硬化膜で、アクリル系などの紫外線で硬化し得る被覆材組成物を塗布した後に紫外線を照射して硬化させた紫外線硬化型のもの、シリコン系、メラミン系等の樹脂組成物からなる被覆剤を塗布した後に加熱縮合によって形成した架橋硬化型のもの等が好適に用いられるが、基材との密着性、膜の性能、及び生産性等の点から紫外線硬化型のアクリル系表面硬化膜が好ましい。

【０００９】また、表面硬化膜の表面活性化処理は、通常のプラズマ処理、コロナ処理、アルカリ処理、又はクロム酸処理が適用される。

【００１０】プラズマ処理は、低圧下のガス雰囲気に高電圧を印加し、持続するグロー放電に合成樹脂板をさらし、グロー放電中に生成した電子、イオン、励起原子、ラジカル、紫外線等の活性粒子で合成樹脂板の表面硬化膜を処理するものである。真空系内に導入されるガスとしては酸素、窒素、空気、アルゴン等の無機ガスや有機化合物蒸気、又はこれらの混合物を用いることができる。系内のガス圧は０．００１～０．１Ｔｏｒｒ（０．１３３～１３．３Ｐａ）、好ましくは０．０１～０．５Ｔｏｒｒ（１．３３～６６．５Ｐａ）で１～５分間処理するのが好ましい。

【００１１】コロナ放電処理は、電線に高電圧を欠けた場合のように強い電場の領域が局在するときに、この領域に限定された局部的な放電（コロナ放電）が生じる。この放電下に合成樹脂板を介在させて表面硬化膜の表面活性化処理を行うものである。コロナ放電は通常交流を用いるが、正又は負のコロナを必要に応じて用いてもよい。一般には、高周波発信器と電極を有する連続処理が可能なコロナ放電処理装置を用いて、合成樹脂板をコロナ放電電極と対電極の間を通過させて連続的に処理を行う。

【００１２】アルカリ処理は、水酸化ナトリウム、水酸化カリウム等のアルカリ溶液（濃度２～１０ｗ％）を用いて、２５℃で５～１０分間程度表面硬化膜の表面活性化処理を行うのが好ましい。

【００１３】表面活性化処理を施された表面硬化膜上には、無電解の銀鏡反応を利用して、厚さ１０～１５０ｎｍ程度の銀薄膜が形成され、更に銀薄膜の上には無電解メッキ法により厚さ１０～１５０ｎｍ程度の保護膜として銅薄膜が形成される。また、銅薄膜の上に各種塗料からなる保護塗膜を設けてもよい。

【００１４】

【実施例】以下実施例により本発明を更に具体的に説明する。

【００１５】（実施例１）透明なアクリル樹脂板の両面にアクリル系紫外線硬化型の被覆材組成物を塗布し、紫外線を照射して硬化させ、膜厚５μｍの表面硬化膜を形成した。次いでアクリル樹脂板を、濃度１０ｗ%、温度２５℃のアルカリ水溶液中に１０分間放置し、水洗して表面活性化した後、アンモニア過剰のアンモニア性硝酸銀水溶液ＡｇＮＯ,６０ｇ／ｌ（Ａ液）と、水酸化ナトリウム水溶液ＮａＯＨ４０ｇ／ｌ（Ｂ液）と、ブドウ糖水溶液$C_6H_{12}O_6$３０ｇ／ｌ（Ｃ液）を用意し、２５℃の室温でＡ液、Ｂ液、及びＣ液を４：１：１の割合で混合した銀メッキ液をアクリル樹脂板の表面活性化した表面硬化膜上にのせて放置した。表面活性化した表面硬化膜には親水基が生成されているので、銀メッキ液ははじかれることなく均一に広がり、表面硬化膜上に銀反応により均一な銀薄膜が形成された。この銀薄膜を保護する＊ために、硫酸銅（II）水溶液還元剤溶液（亜鉛粉末懸濁液）により銅薄膜を形成し、更に裏打塗料を塗布して保護塗膜を設けて、アクリル樹脂製鏡を得た。得られたアクリル樹脂製鏡は、銀薄膜の密着性が非常に強く、反射特性も優れたものであった。

【００１６】（実施例２）表面硬化膜の表面活性化処理を、直流型真空放電装置を利用し、アルゴンガス雰囲気中で、ガス圧０．０１Ｔｏｒｒ（１．３３Ｐａ）で７０００Ｖを印加し、５分間プラズマ処理する以外は実施例１と同様にしてアクリル樹脂製鏡を得た。得られたアクリル樹脂製鏡は、実施例１で得られたものと同様に、銀薄膜の密着性が非常に強く、反射特性も優れたものであった。

【００１７】

【発明の効果】本発明によれば、銀薄膜の密着性が非常に強く、反射特性も優れた合成樹脂製鏡を簡単な方法で安価に製造することができる。

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